REMARKS

Applicants have reinstated Claims 15 -22 in view of the Examiner's statement in his Office Action mailed February 23, 2004, that the restriction requirement mailed on July 1, 2003 is withdrawn upon further consideration.

As previously discussed in the Preliminary Amendment "A" which accompanied the response to the restriction requirement, there was an error in placement of portions of the description pertaining to the invention in the application as originally drafted. The portions which were misplaced were obvious in view of the text presented. Such portions of the description were deleted from the "Background of the Invention" section of the application and were relocated to the "Detailed Description of the Preferred Embodiments" section of the application. Although the relocated text was correctly specified for insertion at the new location, there was a typographical error in the deletion of a paragraph of description which appeared at Page 3, lines 24 - 30, continuing at Page 4, lines 1 - 7, of the application as originally filed. The request for deletion referred to lines 26 - 30, rather than lines 24 - 30. Since this would leave lines 24 - 26 undeleted and meaningless by themselves, it is obvious these lines need to be deleted. Applicants have made a request for deletion of the paragraph of description which was present in the original application at Page 3, lines 24 - 30, continuing at Page 4, lines 1 - 7, in the present Amendment "B", so that the request for deletion is complete, and the entire paragraph (which was moved) is requested to be deleted.

Rejection of Claims Under 35 U.S.C. § 103(a)

Claims 1 - 34 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,543,044 to Inanami et al. and U.S. Patent No. 5,955,878 to Miyajima.

To be citable as a reference under 35 U.S.C.§ 103 (a), a reference must meet one of the requirements under 35 U.S.C. § 102. The application for the present invention was filed July 13, 2001. The Inanami et al. application was filed in the U.S. on March, 23, 2001, and was not published until November 1, 2001. Thus, the Inanami et al. reference should fall under 102(e)/103; and, if applicants' invention was made before the Inanami et al. application was filed in the U.S., this reference cannot stand. Applicants contend that the Inanami et al. reference can be distinguished from their invention. However, in the event the Examiner does not agree, applicants reserve the right to provide a Declaration swearing behind the date of this reference.

The Examiner has commented that applicants' recitation that an element is "configured to" perform a function is not considered by the Examiner to be a positive limitation, since this requires only the ability to perform. The Examiner does not consider this recitation to constitute a limitation in a patentable sense. Applicants do consider this recitation to be a patentable limitation as it is; however, in order to expedite allowance of the present application, applicants have amended the claims reciting "configured to", to substitute language which may be more acceptable to the Examiner.

Applicants respectfully contend that the present invention is not obvious in view of a combination of the Inanami et al. and the Miyajima references.

The Inanami et al. reference pertains to a method of extracting characters for CP exposure and a computer-readable recording medium. In particular, in the method, in a first step, design

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data is prepared which has a hierarchy with regard to figure cells which are design data of a device pattern for exposure. In a second step, candidates for the figure cells corresponding to the characters "from all levels of figure cells in the design pattern data" are extracted by using a hierarchy with regard to the figure cells in the design pattern data. The purpose of the extraction is said to be so that at least one of the number of kinds of characters or the number of shots of electron beams may be the smallest when the exposure is performed using at least one part of the device pattern. (Col. 2, lines 65 - 67, continuing at Col. 4, lines 1 - 12.) Applicants' invention relates to pattern generation equipment used for microlithographic applications, such as the fabrication of masks for use in producing integrated circuits, as well as for other applications. Applicants' invention claims a pattern generation system which employs a graphics engine (Claims 1 - 6 and 13 - 14); claims a graphics engine specifically designed to make use of applicants' cached cells of hierarchical data (Claims 7 - 8 and 13 - 14); claims a pattern generation system which generates beam control data for causing at least one beam to image a pattern on a target (Claims 9 - 12); claims a processor programmed to generate a set of hierarchical image data (Claims 15 - 19); claims methods for generating a set of hierarchical image data (Claims 20 - 22); and claims methods for generating beam control data for causing at least one beam to image a pattern on a target (Claims 23 - 34). To the best of applicants' knowledge, the Inanami et al. reference does not address a pattern generation system employing cached cells of hierarchical data, and does not address a graphics engine. In addition, the Inanami et al. reference does not address methods for generating beam control data, which, in applicants' claimed method, employs storing of cell sets, including more than two levels of

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hierarchy (typically three) in a memory, and commonly employs a specifically described graphics engine capable of handling such data storage.

With respect to applicants' methods of generating a set of hierarchical data, this is done using a processor programmed to carry out a series of steps, the combination of which is not described in the Inanami et al. reference. One of applicants' methods pertains to generating a set of hierarchical image data where the cell size does not exceed a cacheable size, this data to be transferred to a graphics engine in response to a set of hierarchical raw image data.

Applicants' main focus is on methods of reducing the number of communications which must be handled by a graphics engine, for example, or other data processing apparatus which is the bottleneck for throughput in lithographic pattern generation systems. This purpose is described in applicants' Specification as originally filed at Page 5, lines 6 - 25. There is no discussion or even mention of this problem in the Inanami et al. reference. Applicants are solving a problem which was not addressed in the Inanami et al. reference using a series of steps and apparatus which are not described in the Inanami et al. reference. Both the Inanami et al. reference and applicants use hierarchy cells in the design of pattern data, but this does not render obvious applicants' invention which makes use of hierarchical cells including more than two levels of hierarchy in a particular manner.

The Miyajima reference discloses a method and apparatus for producing exposure data used for exposing a design pattern of a semiconductor integrated circuit on an exposure medium. (Col. 1, lines 6 - 11) The apparatus described is a variable rectangular electron beam exposure apparatus. To reduce the amount of layout data needed for exposure, a predetermined process is performed on exposure pattern data that repeatedly appear in the design pattern of a

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semiconductor integrated circuit. (Col. 1, lines 48 - 68.) The method disclosed in the Miyajima reference has a step of repetitively extracting exposure pattern data from data of the design pattern, as a group of exposure pattern data, and of rearrangement of an information table, including information for placing of repetitive exposure pattern data. There is no discussion of the use of a hierarchical set of image data of the kind described and claimed by applicants.

Applicants' system for pattern data analysis and employment of the analyzed data to control a beam which writes a pattern makes use of a system of hierarchical data processing which was not even contemplated in the Miyajima reference. Applicants' invention takes geometrical descriptions and coordinates for the pattern to be written and sorts these descriptions into cells which contain more than two levels of hierarchical data, cells which are nested and called up for printing using subroutines in the manner described and claimed by applicants. The geometrical descriptions in the form of cells and residual data are stored in a three-dimensional cacheable size. The geometrical descriptions are not of a two-dimensional layout table design of the kind described in the Miyajima reference. The number of levels of hierarchy available in applicants' invention coordinates with a multi-level geometry description which was not previously employed. As applicants claim, the invention makes use of more than two, typically three, levels of hierarchy, where the hierarchical image data includes residual data and a set of cells, each of the cells determining a feature set of the pattern, where the residual data includes at least two subroutine call commands, and each of the subroutine call commands identifies a cell of the set of cells and a portion of the target at which the feature set determined by the cell is to be imaged. Applicants' invention focuses on the manner in which the hierarchical data is processed, stored, and called for use.

Further, there is nothing in the Inanami et al. reference nor the Miyajima reference which describes or even suggests a data generation subsystem of the kind described by applicants. Applicants' data generation subsystem determines a hierarchy graph for the raw image data, produces a tentative version of hierarchical image data, and sorts cells of the tentative hierarchy graph in accordance to their individual three-dimensional size relative to the total size of the set of raw image data. Applicants' subsystem then identifies the largest cell size, checking this against a cacheable size; determines whether inclusion of such a cell would cause the size of the residual portion of the hierarchical image data to exceed a predetermined maximum size; and, if so, identifies a new cell that contains multiple instantiations of the largest cell size, and which does not exceed the cacheable size. The tentative hierarchy graph is then updated, and the tentative version of the hierarchical image data is updated.

The kinds of operations and systems described by applicants are an improvement over the art described in the Miyajima reference. While some of the steps described by applicants in developing of design data having a hierarchy may be similar to the method of extracting characters described in the Inanami et al. reference, the overall apparatus and method of analyzing and storing cached data described by applicants are significantly different from those discussed in the Inanami reference. While the Inanami et al. reference focuses on a reduction in the number of kinds of characters and/or the number of shots in performing an electron beam exposure, applicants have developed a system which enables the three-dimensional storage of geometrical descriptions in a manner which requires the minimum transfer of data within a computer automated pattern generation system. Applicants are "debottlenecking" a geometrical

description imaging system which provides beam control data for production of a lithographic mask, as well as for similar applications.
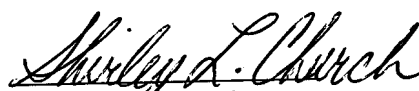
In view of the distinctions discussed above, one skilled in the art will understand that even a combination of the subject matter disclosed in the Inanami et al. reference and the Miyajima reference does not teach or even suggest applicants' invention.

The Examiner is respectfully requested to withdraw the rejection of Claims 1 - 34 of applicants' invention under 35 U.S.C. § 103(a), as being unpatentable over U.S. Patent No. 6,543,044 to Inanami et al. and U.S. Patent No. 5,955,878 to Miyajima.

Applicants contend that the presently pending claims as amended are in condition for allowance, and the Examiner is respectfully requested to enter the present amendments and to pass the application to allowance.

The Examiner is invited to contact applicants' attorney with any questions or suggestions, at the telephone number provided below.

Respectfully Submitted,

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